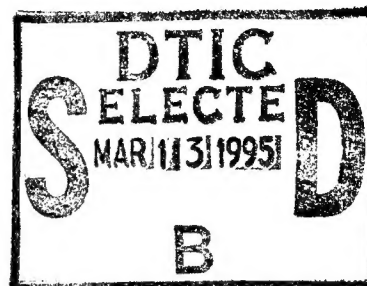


AOARD REPORT

Japanese Radio Science Conference

Aug and Sept 1993
W. Boerner
Univ. of Illinois at Chicago



The research trip summarizes highlights from three conferences or workshops in which Dr. Wolfgang-Martin Boerner participated during the period of August and September 1993, in Japan. The three conference were: the 1993 International Geoscience and Remote Sensing Symposium, 18-21 Aug, Tokyo Japan; the XXIVth General Assembly of the International Union of Radio Science, 25 Aug - 2 Sept, Kyoto, Japan; and the First International workshop on Electromagnetic Phenomena Related to Earthquake Prediction '93, 6-8 Sep, Tokyo, Japan, Dr. Boerner's visit was supported, in part, by the AFOSR Window on Asia program.

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RESEARCH TRAVEL REPORT ON 1993 AUGUST 25 - SEPTEMBER 09 JAPAN CONFERENCE PARTICIPATION
(IGRASS'93, URSI-GA'93, IWEPREP'93)
BY PROFESSOR WOLFGANG-M. BOERNER

(1993 September 15)

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1993 Sept 24

PROJECT PHASES:

I: 93AUG15-22, IGRASS'93, TOKYO, JAPAN
C: (93AUG23-27, UIC-INTERRUPT, CHICAGO, USA)
II: 93AUG28-SEPT02, URSI-GA'93, KYOTO, JAPAN
N: (93AUG03-05, MUCIA-EAGLE, NIIGATA, JAPAN
III: 93AUG06-09, IWEPREP'93, CHOFU/TOYKO, JAPAN

Synopsis: It is my pleasure to summarize my observations made during the recent 1993 AUG15-SEPT09 Japan conference travel supported by AFOSR/NI & AOARD. The research trip consisted of three major sponsored sections (I, II, III) and two unsponsored interrupts. (C: forced upon me by virtue of change of fall semester starting dates from Sept. 4th Week (quarter system) to Aug. 3rd Week (semester system) counter original arrangements; N: MUCIA-EAGLE Graduate Research & Education Exchange Interaction of UIC-EECS/CSL with NI-ISE/RSL and KAIST-ECE/WSL at NIIGATA UNIVERSITY, Ikarashi Campus, Niigata, Japan). Based on my research expertise in 'HIGH RESOLUTION POLARIMETRIC WIDEBAND (1mHz - 10PHz), MULTISPECTRAL CLOSE-RANGE TO REMOTE SENSING AND IMAGING OF LOW OBSERVABLES EMBEDDED IN A NOISY (ANTHROPOGENIC & NATURAL) AND CLUTTERED BACKGROUND ENVIRONMENT', the trip report will cover only sessions on closely related subject matter on 'Wide Area Surveillance of the Terrestrial and Planetary Covers (mantle, lithosphere, atmosphere - iono/magneto-spheres)'. Because of the multitude of up to eighteen (18) parallel sessions, no attempt was made to cover non-expert material. All of the three meetings and the two interrupts identically focused on the same motto: 'TOWARDS A BETTER UNDERSTANDING OF THE TERRESTRIAL AND PLANETARY ENVIRONMENTS' which is synonymous with my specific current research interests of advancing high resolution electromagnetic sensing and imaging to the ultimate resolution limits of physical realizability. To what extent this goal has been achieved within various spectral regions is assessed, identifying potential sources of future conflicts; e.g., the impending 'EMC Radiation Hazard Catastrophy of uncontrolled Anthropogenic Radiation Litter' with respect to environmental sensing and imaging of the terrestrial biosphere and associated with it the arising problems of the free disclosure of environmental sensing and imaging signatures which are being unduly monopolized for commerical purposes.

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WMB:AFOSR/NI & AOARD

1993 September 15

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INTRODUCTION

This research travel project on attending three major, strongly interlaced international meetings during the "International Lecture-Free Worldwide ACADEMIC Recess Window of August 15 - Sept. 15 (annually: by international agreement with the UNESCO Educational Program)" resulted from previous interaction with members of the Planning and Organization Committee for URSI-GA'93 and IWEPREP'93 as well as with the URSI Commission F Chairman of IGARSS'93 in that I strongly promoted the adopted motto of 'A BETTER UNDERSTANDING OF THE TERRESTRIAL AND PLANETARY ENVIRONMENTS'. Therefore, I prepared a well rounded number of invited, solicited and contributed papers which were included in the programs dealing with my subject matter of research expertise on 'High Resolution Polarimetric Sensing and Imaging of Low Observables Embedded in a Dynamic Background Clutter Environment'. This specific topic was also the focus of my NAVY-ASEE-SFRP'93 Distinguished Professor engagement on 'Wideband Polarimetric Sensor Signature Fusion' with NAWC (NAWCADWAR, NAWCWD CL, NAWCWD PMTC), NSWC (NSWC DAL, NSWC-CSS), NRL-NOARL, NCCOSC-NRAD, including research travel to Norway (NTNF-PFM), Denmark (DDRE), Holland (TNO, SHAPE-TC) and Russia/Siberia (MOSCOW, TOMSK, Sankt-PETERSBURG, KARELIA) as reported separately in a 1993 EUROPE & NAVY-ASEE/SFRP Research Travel Report, 93 August 10 (attached). In context with these extensive, laborious and energy consuming travels, the integration of a NW Pacific Rim travel contributed profoundly in obtaining an integrated up-to-date global picture on 'Acoustic, Electromagnetic, Seismic and Seismo-electromagnetologic Sensor Signature Fusion' and its application to 'Wide Area Surveillance of the Terrestrial Biosphere' which is being placed under daily almost exponentially increasing stress. In context with this set of Japanese and European meetings as well as a closely related symposium, PIERS'93 July 12-16, CAL-TECH/JPL, Pasadena, CA, for which I planned, organized, coordinated and executed ten (10) Special Sessions on Polarimetry (Theory, Metrology, Systems Calibration, POL-RAD, POL-SAR, and its applications), I wish to emphasize my engagement in accruing research Travel funds for Russian scientists to attend PIERS'93 (12), IGARSS'93 (8), URSI-GA'93 (18), IWEPREP'93 (18) through the 'International Science Foundation', founded by George Soros. Thus, some of us were given the opportunity together with our European (EC/CIS), North American (US/CANADA) and NW Pacific Rim (CIS-Pacific Siberia, KOREA, Japan, Taiwan) allied experts to meet several times convening on a very focussed set of most relevant, timely, global research objectives which are being pursued with vigor in the preparation and editing of the following reports. These conference research reporting objectives include:

- (1) advancement of wideband (~ 1mHz - 10PHz) complete polarimetric, high resolution electromagnetic sensing and imaging procedures;
- (2) multi-sensor (acoustic, electromagnetic/thermal, seismic, seismogenic) signatures fusion for the early detection of hostile targets and toxic agents endangering our terrestrial biosphere;
- (3) the protection of environmental signature information from classification and commercial misuse;
- (4) the reduction of unwarranted acoustic, electromagnetic, seismic and seismogenic noise produced by anthropogenic emission sources (e.g. mobile communications; direct satellite TV reception; NIR-OPT-NUV high intensity illumination of urban metropolitan regions; DC operated trolley, train, mining equipment, electronic car and household machine emissions, etc.);
- (5) utilization of high resolution sensing and imaging in wide area surveillance of the terrestrial biosphere during the impending transition from 'nationalist military toward global environmental defense' by peaceful means.

I am fortunate to report that my entire 1993 summer program was successfully dedicated to this most urgent mission for the future existence of 'life on earth', and that the outcome of the three major Japanese meetings are strongly in its support. Therefore, I am especially grateful to the US Air Force of Scientific Research, Academic and Industrial Affairs Division as well as its Asian Office of Aerospace Research and Development for providing the support to complete this year's international summer travel projects and for showing interest in co-sponsoring related pertinent expert research retreats in conjunction with near-future Pacific Meetings.

IGARSS'93, The 1993 International Geoscience and Remote Sensing Symposium:
'BETTER UNDERSTANDING OF EARTH ENVIRONMENT',
Kogakuin University, Shinjiku, Tokyo, Japan
1993 August 18-21

This IEEE 1993 International Geoscience and Remote Sensing Symposium (IGARSS'93) was held jointly with the International Commission F, Wave Propagation and Remote Sensing, of the 'Union Radio Scientifique Internationale (URSI) at the new central urban Kogakuin University highrise building campus, close to the west side of Shinjiku Railroad/metro-station in downtown New Toyko. It was attended by about 650 international (overseas: 280 and Japanese: 370) environmental (electromagnetic wave propagation) scientists from 39 countries and resulted in 580 presented papers collected in a two set Proceedings of 2,400 pages. As expected from a Japanese Conference of this kind, it was very well organized, and the two high-rise buildings (KU and STEC JYOHU) were ideally suited to house the very attractive exhibition in its foyer, mainly on SAR-image processing systems, as well as the participants in a well arranged three-floor set of closely located lecture rooms (classrooms). This allowed for rapid transfer from one lecture room to another which unfortunately was required due to the rather unexpected, very poor scheduling of sessions and papers; e.g., arranging all sessions on a major topic within the same time slot with multiple sessions on very closely related topics in parallel, instead of spreading them out in sequence (which caused a lot of consternation and unpleasant wrangles for a great many attendees). [Note, as a member of the Planning Committee and Co-chair of the URSI-F TPC of IGARSS'94, CAL-TECH/JPL, Pasadena, CA, 1994 August 8-12, every effort will be made to cut out any of such highly political manouvuers]. Otherwise, the symposium and especially the symposium banquet were truly outstanding and so were most of the papers as may be seen from a perusal of the voluminous Proceedings.

Major emphasis was placed on recent advances in airborne and space sensor design, image and signature interpretation, primarily of existing and various new earth resources satellite programs such as JERS-I (the Japanese Fuyou-1), the ASTER (Advanced Spaceborne Thermal Emission and Reflection) radiometer for the EOS-AM platform and the interferometric monitor for "greenghouse (IMA) gases" planned for the ADEOS platform. This was also the topic of the JERS-I Users Workshop of 1993 August 16 & 17, Kogakuin University, Shinjiku/Toyko (of which I attended various presentations: see Attachments). As was indicatative from the two well chosen and superbly presented Plenary Session Opening Papers by former ISAS Director, Prof. Emer. Dr. Minoru Oda, 'History of X-ray Astronomy: The universe seen through a bamboo screen', and of famed reforestation-ecologist Prof. Emer. Dr.h.c., Dr. Sci. Akira Miyawaki, 'Global Perspective of Green Environments - the restoration of native indigenous sub-tropical/tropical forests...', the symposium planning committee from the outset placed central importance on 'global environmental near-range to remote sensing' of the terrestrial as well as planetary covers. Because I personally consider the subject matter of 'Restoration of Indigenous Forest Ecosystems' in relation to the highly misinterpreted 'acid rain' and 'greenhouse warming' (hitherto not proven) catastrophes of such visionary relevance, the copy of a recent publication by Distinguished Professor Emeritus, Dr. h.c., Dr. Sci. Akira Miyawaka is appended to this report. Incidentally, topics on Continual Monitoring and Airborne/Space Surveillance of 'Global Tropical/Sub-tropical Jungle Restoration Projects' were further discussed during an expert retreat at KORAKU-EN Japanese Gardens at Okayama, South East Honshu, 1993 Aug. 23/24 which is relevant because of the finding that in order to obtain improved environmental/ecological parameters on densely-to-sparcely vegetated tropical/sub-tropical forests and vegetated regions, it is essential to develop "Polarimetric Multi-spectral Airborne SAR" systems covering the entire 200 MHz to 90 GHz region. However, due to the non-availability of 'free scientific spectral windows' within the 150 MHz to 920 MHz spectral region; a very serious gap exists for global surveillance of our terrestrial biosphere!

This finding was exemplified also during various sessions of IGARSS'93, dealing with POL-SAR Remote Sensing of vegetated and forested regions clearly indicating that pertinent robust environmental algorithms on determining and classifying vegetative

parameters cannot be developed to its physically realizable limits because of 'the lack of POL-SCATTER-OMETRIC & POL-SAR imagers at, say about 100-150 MHz, 200-240 MHz, 300-330 MHz, (existent: 420-460 MHz: AIR-SAR, P-band), 550-570 MHz, 650-680MHz, 750-780 MHz, 840-860 MHz, 920-940 MHz (could be developed). On the other hand, very considerable frustration and complaints were voiced on the currently exponentially increasing electromagnetic noise within the entire ULF (~ 1mHz) to UV (10 PHz) spectral regions due to the non-sensical, uncontrolled and deplorable means of radiation pollution by: (1) DC-operated railroad/ trolley-bus/street-car/metro systems; (2) ULF/VLF noise due to improperly shielded electromotive equipment reaching up into the HF bands; (3) Mobile telephone and TV; (4) Satellite communications, TV and GPS, etc.; (5) Day and night NIR-OPT-NUV stress illumination in metropolitan and densely populated regions; just to mention a few critical modica of detrimental global radiative environmental pollution, i.e., 'radiation littering of the terrestrial biosphere'. Here, the very stearn warnings of our global community of entomologists ought to be heeded in that an overdose of acoustic and electromagnetic noise makes insect infestation thrive, and will possibly cause detrimental after-effects at a level similar if not superior to the 'ozone hole' calamity in the not-too-distant future. Indeed, every possible step must be undertaken in order to drastically reduce all unnecessary anthropogenic environmental acoustic, electromagnetic as well as seismic noise sources; also, from the perspective of global environmental defense of the terrestrial biosphere.

Although, during many of the pertinent sessions the importance and relevance of 'polarimetry' was broached on, by no means were its basic and applied potential appreciated nor properly understood, and definitely more research support must be expended on advancing 'polarimetry' throughout the entire non-invasive electromagnetic spectral region of about 1mHz to 10PHz for the coming decade. Also, the concept of 'Interferometric POL-SAR' and its application to the detection of 'lithospheric stress build-up' and of 'vegetational growth stress conditions' was introduced which opens a wide door for novel 'polarimetric differential constrast imaging' approaches for detecting slow to rapid state changes of the terrestrial environment.

Various detailed critical expositions on specific topics covered during IGARSS'93 are appended together with the Final Symposium Report to be forthcoming by about 1993 December 15.

In conclusion, the various invited and some of the extraordinary presentations during IGARSS'93 clearly demonstrated that near-range (in situ) spectrometric monitoring (with space transponder data transmission) and high resolution polarimetric remote sensing will strongly assist in the 'impeding transition from nationalist military toward global environmental defense', an evolutionary step mankind must achieve soon unless it desires to wither away and have 'Life on Earth' degenerate into primeval chaos.

A detailed exposition (30 minute presentation) has been prepared in order to amplify the salient points. Technical details may be assessed in the carefully assembled and well done two-volume set of the 2400 pages Proceedings. The follwing major recommendations may be extracted:

- (1) The IEEE Geoscience & Remote Sensing Society together with the URSI, International Commission F request that several additional POL-SAR spectral windows within 150 MHz to 920 MHz be made available for strengthening the present requirements for 'wide area survaillance of the Terrestrial Biosphere';
- (2) IEEE-GSRSS and URSI-E-F-J/K desire that immediate steps be introduced for reducing the anthropogenic generation of excess acoustic, electromagnetic, seismic and seismogenic noise; i.e., "radiation littering of the terrestrial biosphere" should be treated in a manner similar to roadside and other environmental litter reduction methods;
- (3) IEEE and URSI ought to request that any near (close) range to remote sensing signatures pertinent to the wide area surveillance of the terrestrial biosphere not be commercialized, but be made available free of extra-charge for those involved in developing environmental hazard detection and disaster mitigation algorithms and methods.

UIC-EECS/CSL EDUCATIONAL INTERRUPT (93 AUG. 23-27) DUE TO ENFORCED CHANGE OF QUARTER TO SEMESTER SYSTEM AT UIC, CHICAGO, RESULTING IN ADVANCEMENT OF INSTRUCTION COMMENCEMENT FROM 'FOURTH-SEPTEMBER' TO 'THIRD-AUGUST' WEEK, ANNUALLY!!!

Counter the UNESCO Educational Affairs Division's recommendation of retaining the period 'August 15 - to - September 15' as an 'international lecture-free academic recess time window', an increasing number of US Universities are being forced by their respective 'State Boards of Higher Education' to clutter it up by advancing the instruction commencement date from after the second/third week in September up to the middle of August - counter the objections of the academic staff from applied sciences, engineering and other professional faculties. This is becoming a serious problem for 'US Internationalist Academicians', and I was made a sad victim of this change! In addition, although prior teaching/instruction replacements were agreed upon long before the date of my departure, such were annihilated by dictation of the ISBHE, one day prior to departure.

It should be noted here that all of the three International Events attended, namely IGARSS'93, URSI-GA'93 and IWEPREP'93 were previously arranged to be executed well within the 'internationally adopted' Annual Academia Lecture-Free Window of Aug 15 to Sept. 15. Unfortunately, matters will grow worse as more and more US Universities are cluttering up this lecture-free window by advancing their instruction commencement dates far into the middle of August. Here, it should be emphasized that when these aspects were brought up at the General URSI-Board Meeting in Kyoto, all other nations rejected the US inquiry and request of advancing the date for the next URSI-GAs; and the URSI-General Assembly 1996 will take place in Lille, France, 1996 August 28 - September 05, forcing the exclusion of a great many US radio scientists, i.e., expell them from participation. This indeed is a serious matter and must therefore be reported here; and on behalf of many of my US colleagues, we would like to request that AFOSR together with ARO, ONR and NSF, NIH, 'NIE', etc. take immediate corrective action.

In any case, I was forced to interrupt my program, cancel various well planned meetings and visits in Japan, and I returned late Sunday Evening 93 Aug. 22 to the UIC Campus, organized lecture notes for the EECS-320 (8-9), EECS-321 (10-11) Monday, Wednesday, Friday lectures and the EECS-520 Tuesday, Thursday (14-16) graduate seminar periods; and departed on Friday 93 Aug. 27, 11:05 immediately after class and before noon to catch the return flight to Tokyo at 12:55 noon.

Yet, this academic interrupt served many important functions of international data exchange and rapid scheduling of international cooperative ventures of direct interest to the AFOSR/AOARD programs, such as the MUCIA-EAGLE collaboration on advancing high resolution sensing and imaging research and graduate education between UIC-EECS/CSL, NI-ISE/RSI and KAIST-ECE/WSL. Therefore, I feel and I am very highly indebted to Drs. Shiro Fujishiro, Dr. Susumo Joe Yakura and Capt. Paul A. McQuay of AFOSR/AOARD at Roppongi, Minato-Ku, Tokyo for their understanding and assistance and so also to Col. Harold S. Rhoads and Mr. Timothy Biggs of AFOSR/NI at Bolling AFB, DC for their acceptance of my exemplary case of nation-wide disregard for international academic cooperation. Unfortunately, with deepest regret I missed my appointments with various laboratory directors of Griffiss AFB, Hanscom AFB, Wright-Patterson AFB, Kirtland AFB and Eglin AFB as well as the AFOSR and others; and I request their sincere understanding of this uninvited interruption, and their immediate action to guarantee reduced hardships in the future.

My very sincere and special thanks to Prof. Korada Umashankar for substituting instructions in EECS-320 and to Prof. Piergiorgio L. E. Uslengi in EECS-321, respectively, during the period of 1993 August 29 to September 09, are herewith gratefully acknowledged. Finally, I would like to thank the UIC-MUCIA and International Affairs Program Office for assisting me in covering the extra expenses incurred and for supporting the subsequent NIIGATA University collaborative graduate education and research reported on in Section N.

URSI-GA'93, The XXIV-th General Assembly of the International Union of Radio Science: MODERN RADIO SCIENCE AND THE TERRESTRIAL AND PLANETARY ENVIRONMENTS; Kyoto International Conference Hall (KICH), Takarugaike Park, Kyoto, Japan, 1993 August 25 - September 2.

The XXIV-th General Assembly of 1993, attended by more than 1200 people from more than fifty (50) member countries, is the best organized and most memorable General Assembly of the five general assemblies of URSI, two each of IUGG-GA and IAGA-GA, I have attended. Its brilliant organizers, foremost Professors Hiroshi Matsumoto, Takashi Okoshi, Iwane Kimura, Fumio Ikegami and Toshio Oguchi of Kyoto University and their able colleagues like Dr. Yoji Furuhashi of ATR, profusely deserve our most respectful gratitude for the dedication, love, tastefulness and scientific perfection with which this splendid gathering was planned, organized and executed in: one - if not the most superb - international conference centers in a city with beauty, grandeur and elegance, matched and surpassed only by a few like Firenze, Sankt-Petersburg and pre-war Dresden. Notwithstanding the brevity inflicted on writing this report, also Dr. W. Ross Stone and contributors to the 'Review of Radio Science 1990-1992', as well as Prof. Hiroshi Matsumoto and contributors to 'Modern Radio Science 1993' deserve citations for a excellent job done in identifying the mindboggling progress made during the passed three years with the introduction of HDTV, international acceptance of mobile communications (a curse rather than a beneficial contribution), spaceborne SAR Ocean surveillance, global Ionospheric modelling, etc. Also, great care was taken in properly scheduling sessions so that minimum overlap occurred - a fete which deserves special mentioning - and quite differently strategized from what we had to tolerate during the IGARSS'93.

However, in attending the second week of the assembly most actively; it need here be stressed and strongly emphasized that with the enormous progress made in, for example, mobile communications, direct satellite TV, effective NIR-OPT-NUV illumination of our densely populated metropolitan areas, we at the same time have inflicted serious, detrimental threats to the future existence of our biosphere. In fact, 'we indeed don't get something for nothing', i.e., improper usage of 'direct satellite communications and TV', 'mobile telephone communications and TV', 'irrediculous over-illumination of urban regions, etc.' must be curtailed at once (unnecessary radiation litter of the terrestrial biosphere ought to be banned) and dedicated usage ought to be permitted only by the regulatory governmental agencies (police, disaster mitigation and hazard control, scientific purposes, etc.). During the many sessions of Commissions A, (B), E, F, G-J and K attended, very explicit complaints were forthcoming on the seemingly 'exponential increase of radiation litter' of all kinds of man-made wave emitting noise sources whether acoustic, electromagnetic and/or seismic in nature. Especially, during pertinent sessions of Commissions E, G-J and K, the rapid increase in anthropogenic acoustic and electromagnetic noise and signature emissions was considered a direct threat for the continuance of monitoring and analyzing natural terrestrial, planetary and galactic signatures and noise covering the entire electromagnetic non-invasive spectrum. In fact, these serious impacts of modern radio communications with its advent of uncontrolled mobile communications, direct mass satellite TV, high density NIR-OPT-NUV urban region illumination, etc., is considered a serious threat, say 'radiation litter' to Radio and Optical Astronomy, to ULF/ELF Aeronomy and Seismo-Electromagnetology which require coordinated world-wide regulatory action much more stringent than the 'ozone/fluor-carbon policies', and in particular, increased global education on 'general environmental radiation hazards'. I personally consider these aspects of generating uncalled-for anthropogenic noise emissions also a direct threat to future civil and military aircraft operation and flight control. The US AFOSR, ARO, ONR, NSF, NIH, NIE, etc. ought to call full attention to this serious threat inundating us and provide support for re-educating the culprits - all inclusive!

Also, it was found that although polarimetric near-range to remote sensing concepts are being accepted in increasing numbers of presentations, the full extent of basic and applied concepts is far from being comprehended nor from being properly applied.

For example, the well-done presentation by renown pioneer in 'polarimetric radio meteorology', Prof. Dr. Sci. Tomohiro Oguchi on "Depolarization due to multiple scattering in radio and its effect on radar measurements (at nadir) of rain parameters (F6-5)", which almost passed unrecognized because of the mathematico-physical complexity of the subject matter, deserves highest praise and sincerest consideration in that it was clearly established that at radar bands of 10-90 GHz, complete polarimetric doppler airborne (vertically downlooking) space radars operated at Nadir ought to be implemented as was suggested by him and myself, and a few others (Prof. Thomas A. Seliga, Dr. Jacob J. van Zyl) long ago, during initial planning meetings of the TRIMM meteorological space radar, unfortunately to no avail (mainly due to stubborn dullness of some pompous wisecrack(s) in command!) and be it clearly stated: deca-millions of valuable research dollars were ill-invested by NASA and other agencies! In addition, very clear and definite demands were also made during various Commissions E/F/G/J committee meetings that distinct spectral bands be freed solely for scientific and 'terrestrial and planetary environmental surveillance' purposes, spectrally very much the same as those demanded during IGARSS'93. However, it need be emphasized that demand for freeing spectral windows, say for example, within 100-150 MHz, 200-240 MHz, 300-330 MHz, (existent: 420-460 MHz: AIR-SAR/P-Band) 550-560 MHz, 640-680 MHz; 750-775 MHz; 840-860 MHz, 920-940 MHz, etc., was made not only by active members of Commission F, but also from those of Commissions E, G, J and also K. Such a demand should also be of direct interest to the operation of the US Air Force, Army and Navy for 'Wide Area Military Surveillance Sensor Systems'. Obviously, if such 'extra environmental surveillance windows' cannot be made available, the design, manufacture and deployment of complete polarimetric (scattering/transmission matrix) UWB Impulse (interferometric) POL-SAR/ SAL Systems must be rapidly advanced by covering the entire 100 MHz - to - 100 GHz and the NIR-OPT-NUV spectral regions, respectively, which, however, would add to the impeding radiation litter catastrophe.

Although it is impossible to list all highlights; here, those sessions and papers dealing with the acquisition of environmental parameters by radio waves covering the entire non-invasive electromagnetic spectral domain require mentioning. It was found that a great amount of such 'environmental near-range to remote sensing data' is being collected, unfortunately however, in a rather uncorellated manner, i.e, in spectral piece meal approach. Thus, instead of applying proper multi-spectral (ULF-to-UV) simultaneous sensing, monitoring and data acquisition and signature fusion, a rather sloppy, unorganized chaotic approach seems to prevail. Furthermore, because of the lack of oversight and proper data collection and fusion approaches, various commercial enterprises are readily misusing this unfortunate situation for their own profit-benefits. Thus, much more care must be taken by all - civil and military agencies alike - in ensuring that proper cost-free scientific use of environmental information gained by "modern radio scientific methods" can be guaranteed also in the spirit of the paradigm shift of 'defense from nationalist industrial-military toward global peaceful environmental defense'!

Before concluding the reporting on this most thought provoking and inspiring URSI-General Assembly in the cultural 'Kleinod (gem)' of Kyoto-Nara, the advances made in the much controversial but steadily advancing 'new science of seismo-electromagnetology' deserves to be introduced here. It is no longer a secret that 'Classical Seismic Earthquake Prediction' has failed almost in every aspect for providing near to intermediate reliable prediction forecast signatures in spite of deca-millions of dollars spent! At the same time, 'the existence of seismogenic' ULF to VLF (~ 50 mHz to 200 KHz peaking within about 1 Hz to 6 Hz) magnetometric, electrometric and electromagnetic signatures prior to and during lithospheric stress episodes' can no longer be disputed as is currently being exercised by the worldwide community of 'prediction seismologists'. Session HEG (WED 93-09-01, 14-18) and related poster papers clearly demonstrated the existence of such seismogenic signatures, but also revealed the hitherto rather incomplete and poor metrological approaches and the apparent lack of understanding of these electromagnetic lithospheric stress phenomena observed throughout the ENTIRE electromagnetic spectrum from about 10 mHz to 10 PHz and beyond in the X-Ray spectral region. Unfortunately, almost no simultaneous

extrawideband complete polarimetric (3-axis and/or scattering matrix) measurements over the pertinent 10 mHz to 100 PHz spectral region exist, but need to be developed rapidly as will be examined during the following report on **IWEPREP'93**. With the ever increasing population explosion and the ever increasing population density primarily within lithospheric stress regions (tectonic plate fault zones, etc.) where 'Mother Earth' exhibits its most wondersome natural phenomena, where mineral and geothermal resources concentrate in optimal abundance, and where the cradles of man's passed and future evolution crest, every possible means needs to be explored for detecting electromagnetic lithospheric stress generated signatures for developing earthquake hazard prediction, and disaster mitigation methods. This crucial topic of wide area surveillance for the protection and safeguarding of our biosphere must be and is of direct interest to the national US and international terrestrial planetary and space surveillance departments - **civil and military alike** - and because of its extra-wide-band (~ 10 mHz to 100 PHz) simultaneous sensing requirements requires full collaboration of all involved. Unfortunately, there also were presented a number of rather misguided and ill-conceived concepts which definitely need to be rooted out; however, the current stance of 'seismologists and statisticians' borders on the insane 'science-versus-religious dogma' confrontation of 'Galileo versus the Curia': in that we (seismo-electromagnetologists) are not to comprehend what they (the egocentrically blinded, here: seismologists) cannot and will never be able to see with their instrumentation; and mathematical statisticians will not be able to accept because it so beautifully dismantles their ill-applied Poisson models lacking the proper geophysical Ansatz!

In conclusion, The Wednesday HEG Session on "Electromagnetic Effects (earth's covers: lithosphere, surface-to-ionosphere, magnetosphere) Associated with Earthquakes and Volcanic Eruptions" so clearly demonstrated the apparent current woes of Modern Radio Science:

- (i) The degenerated 'candy-box' approach to the support of scientific sensory research: A single tiny lolly wrapped in an opaque disguise, provided separately - like rabbit out of the hat - to individual research teams, without global scope of the integrated picture. As a result, the lolly dissolves in sweet dreams, the wrapping goes lost in mist, and only bits and pieces accrue at random.
- (ii) Newly developed magneto-metric, electro-metric and electromagnetic ULF-VLF sensors are being patented by small garage-shops; and no national nor international support for developing the high resolution, supra-low-noise sensors seem to exist because worldwide scientific fractalization, e.g. NOAA versus USGS versus NSF versus EPA, etc. prevails. Thus, the urgent need exists to create a **NATIONAL INSTITUTE FOR THE ENVIRONMENT**, squarely integrating ecological, biological, geophysical and geological multi/interdisciplinary sciences. Furthermore, during the impending transition from 'Nationalist Industrial-Military toward Global Environmental Defense' optimal use ought to be made of the existing military high resolution acoustic, electromagnetic, seismic, seismogenic sensing and imaging technology and facilities in a dual-use approach as proposed by former Senator Al Gore and by Senator Sam Nunn: the 'Strategic Environmental Research Defense Program': The development of 'Extra-Wideband High-Sensitivity Sensor Systems, Networks and Arrays for the Detection of Seismo-Electromagnetic Signature Radiation during Lithospheric Stress Built-up' should be explored by such a 'NIE', fully integrating the 'SERDP' as the 'global environmental defense directorate' into its future structure.
- (iii) The detection of seismogenic lithospheric stress signatures requires the reduction of unnecessary anthropogenic radio noise as well as redundant radio signature sources to a minimum. The pertinent **National and International Agencies** must embark immediately in a well coordinated and concentrated effort of banning such unnecessary 'convenience signature noise sources', as

for example, mobile radio communications, direct mass satellite TV reception, DC-operated mass-transportation systems, high-density urban region NIR-OPT-NUV illumination, and other uninvited sources of radiation litter, etc.

- (iv) Furthermore, we require the dedicated assignment of more 'scientific spectral windows' covering the entire acoustic and electromagnetic spectral domains within about 1 MHz to 100 PHz for the purpose of 'Wide area continual surveillance of the terrestrial covers and the lithosphere' from ground and sub-sea-surface/ocean-bottom to spaceborne platforms. This request should be considered of prime relevance also to the US AIR FORCE, ARMY and NAVY, NSF, NIH and NIE, etc.

All of these and many more stringent regulations together with improved worldwide mass education about detrimental health effects and environmental preservation requirements versus unnecessary acoustic, electromagnetic, seismic (e.g. shock wave), seismogenic (e.g. rock fracture) source emissions and the implicit need for reducing unwanted radiation litter of any kind, need to be advanced and strongly supported.

Finally, it should be remarked that the presence of so many former Eastern Block and especially Russian radio scientists very strongly contributed to the excellence of the overall scientific standards during this marvellous URSI-GA'93. The presence of so many outstanding scientists from C.I.S. was made possible almost exclusively via travel support by the 'International Science Foundation', founded by George Soros. Mr. George Soros is to be praised for his wisdom and for developing the albeit single functioning Western agency for the support of Russian scientists. Here, I strongly encourage the US Air Force, Army and Navy to step-up at once and with renewed vigor their support for retaining the strength of international radio science by financing more direct US Laboratory - CIS Laboratory interaction.

On behalf of a great many of my colleagues, I feel destined to express here my sincerest wishes of gratitude to the International URSI Board of Officers, and by copy of this report to its President, Professor Edward Victor Jull of the University of British Columbia at Vancouver, B.C/Canada, I wish that he conveys our thanks to all of the members of his Board and especially to the Japanese organizers.

MUCIA-EAGLE GRADUATE RESEARCH & EDUCATIONAL COLLABORATION PROGRAM OF UIC-EECS/CSL with NI-ISE/RSL and KAIST-ECE/WSL: Advancement of Polarimetric Active and Passive Close-Range to Remote Sensing with applications to the detection of 'buried winter storm/avalanche victims along the Japan Sea/Mountain Ranges, 1993 August 03 - 05, Niigata/Japan

Although planned originally to take place immediately after IGARSS'93 and before URSI-GA'93 during 1993 August 22 - 25, several international attendees of these events gathered at the IKARASHI Campus of Niigata University to pursue interactive research collaboration with Prof. Yoshio Yamaguchi, Niigata University, Information & Sensing Engineering, Radar Sensing Laboratory; with Prof. Hyo-Joon Eom, Korea Advanced Institute of Science and Technology, Electrical & Communications Engineering, Wave Scattering Laboratory, TAE-JON, South Korea; and with Prof. Mitsuro Tanaka, Oita University, Electrical & Communications Engineering, Electromagnetics Laboratory at Oita, Kyushu. All three of them have spent up to several years at UIC-EECS/CSL each, either as visiting or tenure-track research staff.

Next to a series of graduate seminar lectures dealing with 'Direct and Inverse Methods of Polarimetric High Resolution Sensing and Imaging', the indoor-experimental sounding radar research for (i) the detection of buried objects in snow and sandy soils; (ii) winter avalanche victim detection (cars and people: Note that snow drifts can reach the height of eight (8) meters along the Japan seaside during heavy snow storms); (iii) detection of buried mineshafts; (iv) detection of military underground tunneling activities of the North Korean military forces along the North/South Korean demilitarized corridor. Specifically, it was shown that complete polarization utilization is essential for optimal target signal recovery versus noise and clutter rejection in all of these applications. Both Professors Yamaguchi and Eom complained bitterly about the very drastic increase in ambient electromagnetic noise covering the pertinent spectral windows within Japan and especially Korea; a very similar complaint made within R&D Remote Sensing Laboratories visited elsewhere in Japan (Prof. Tsutomu Suzuki, University of Electro-communications, Chofu/Toyko; Prof. Saburo Adachi, Tohoku University, Sendai; Prof. Matsuo Suzuki, Hokkaido Institute of Technology, Sapporo), and in the US and Europe during my 1993 NAVY-ASEE-SFRP engagements (see 1993 June 21 - July 09 Europe/Siberia Research Travel Report).

In context with our joint presentations at IGARSS'93, URSI-GA'93, it is planned to produce a set of basic textbooks on pertinent subject matter to be edited simultaneously in Japanese, English, German, Russian and French. The next get-together is planned for IGARSS'94 at CAL-TECH/JPL, Pasadena, CA, 1994 August 8-12 and in the Fall of 1994 during the ISNRCR'94, Sendai, Japan. Currently, we are engaged in the planning and organization of an Expert Retreat on 'Noise Reduction and Clutter Rejection in Wide Area Surveillance of the Terrestrial Biosphere', to take place either shortly before or after the ISNRCR'94 with possible (anticipated) support from AFOSR-AOARD on "WINDOWS IN SCIENCE". A proposal is in preparation. Furthermore, under the newly developed and instituted EAST-WEST Science Integration Program of NATO-SEAD, a NATO-ARW on 'Wideband Doppler Radar Polarimetry' is scheduled to take place either in FRG and/or Russia during 1995 (postponement of previous dates for NATO-ARW-WDRP'93).

Here, in conclusion, I wish to use the opportunity to express my sincere gratitude to the UIC/NI-MUCIA/EAGLE collaboration program and to the Japanese Ministry of Science and Education (Mombucho) for sponsoring this section of my 1993 Japan Research travels. Also, the dear hospitality of Prof. Masakazu Sengoku, and of family Prof. Yoshio Yamaguchi and wife Machiko is gratefully acknowledged; and so is that of the family of Masami Iwasaki (General Manager, Furukawa Electric Co., Advanced Projects Division, Marunouchi/Toyko) and his dear wife, Prof. Satoko Iwasaki, for their inspiring, always open-minded discussions on most current cultural, social, industrial and political problems concerning Japan and its trade partners. A special note of thanks is added here for my friend and fellow-internationalist, Dr. Paul F. Wacker, Sr. Sci. Emer. (NIST), for his intellectual, mental and other advice and support.

IWEPREP'93, The FIRST International Workshop on 'ELECTROMAGNETIC PHENOMENA RELATED TO EARTHQUAKE PREDICTION: FOR AN IMPROVED UNDERSTANDING OF OUR EARTH'S SEISMOGENIC EIGENRESONANCES'; The University of Electrocommunications (Denki Tsushin Daigaku), Chofu, Tokyo, Japan, 1993 September 6-8

This outstanding expert retreat was attended by about 140 international (75 Japanese and 65 overseas) seismo-electromagnetologists and some (5) dedicated opponents from about 12 countries within which lithospheric stress and energy release (earthquakes and volcano eruptions) require the development of highly improved earthquake hazard prediction and associated disaster mitigation measures. It was the shared opinion of many participants that this workshop, convened primarily by the seismogenic pioneers, Professor Takeo Yoshino and Academician Mikhail Borisovich Gokhberg as well as honorary organizer Prof. Susumo Uyeda; planned and executed by Professor Masashi Hayakawa, UEC, Dr. Sci. Yukio Fujinawa, MITI-IEHP, Tsukuba, and Dr. Kozo Takahashi, CRL, Koganei/Tokyo, will become one of the "Sternstunden" in the history of Seismo-electromagnetology, one of the most controversial new intra/multi-disciplinary geophysical/radio scientific/environmental disciplines. Similar to the dawn of quantitative natural sciences identified with the 'Shift between Galileo and the Curia'; the advent of formal electromagnetism identified by James Clark Maxwell's heroic scientific battles against the established Newtonian school; Max Plank's introduction of quantum mechanics and Einstein's visionary concepts of general relativity; similarly here the established scientific curia of venerable prediction seismologists and telluric earth scientists is riding along with Don Quixote in fervently opposing the dawn of a new scientific discipline. IWEPREP'93 followed with one year's delay the chaotic and ill-managed NSF Workshop (Great Bear Lake, UCR) on "Low Frequency Electric Precursors to Earthquakes: Fact or Fiction?" of 1992 June, which hopefully, was the last of a chain of stubborn attempts by the 'Curia of US Prediction Seismologists' for deliberately preventing progress in advancing theory, metrology, signature fusion of multi-spectral, multi-altitude and diversified acoustic (infrasonic) and electromagnetic vector/tensor signature interpretation, advanced multi-source modeling, etc. The organisational talent, primarily of Prof. Masashi Hayakawa, made an open, objectively presented dialogue possible; although some highly narrow-minded seismic-statisticians and dogmatists tried very hard to derail the event similar to their successful disruption of the "Big Bear Meeting" precisely prior to the earthquake of June 1992 (In the opinion of a multitude of active 'seismo-electromagnetists' this NSF-Workshop was intentionally constructed for misguiding the global scientific community as may be observed from a perusal of the IWEPREP abstracts). Specifically, the well fought scientific counterfeits of the 'VAROTSOS team' versus the 'Papadopolous agency', of the Gokhberg School versus the Evinson-Wyss Poisson-model dogmatists, the brilliant expositions by the true and only (prime) pioneer in the field, Professor Takeo Yoshino, by some visionary expositions of Academician Mikhail Borisovich Gokhberg and by Dr. Jack Dea, by Prof. Vsetolov Isaakievich Shapiro, by Prof. Masashi Hayakawa and especially by famed seismogenic plant sensory bionicist, Prof. Hideo Toriyama need to be cited. It certainly was a very exciting expert retreat including many broadside scientific clashes, however with the very positive outcome that "Electromagnetic (EM) Phenomena observed during Lithospheric Stress" are real, can no longer be denied and are going to play a major future role in earthquake prediction research, most likely "replacing hitherto standard prediction seismology approaches", but definitely must not and cannot fully replace concurrent seismic and infrasonic measurements which always will remain major integral scientific tools of long term lithospheric stress analysis. Furthermore, rightly so, questions were raised on the relevance of 'classical seismology' for the interpretation of seismogenic signatures and the advancement of "seismo-electromagnetology" which requires definitely a much wider, all-encompassing geophysical approach, i.e., the international curia of venerable prediction seismologists may have to be placed in a scientific back-seat ranking as regards the interpretation of seismogenic phenomena and the development of seismo-electromagnetologic metrology, signal processing and measurement technology. As a replacement we need to invite a more open-minded, more broadly educated set of geophysicists and geoenvironmentalists to assist us in the rapidly advancing science of 'seismo-electromagnetology'!

Histerically, seismogenic (electromagnetic signatures associated with seismicity: coined by Prof. Takeo Yoshino) effects were reported for the passed century or more and the first direct quantitative, verifiable measurement observations were made concurrently by Takeo Yoshino and his able metrologist, Ichihito Tomizawa, in about 1980 and by Morgunow et al. within the ULF/ELF bands in Japan and Russia, respectively. Shortly thereafter in Greece, Profs. K. Alexopoulos and P. Varatsos and associates identified seismic electric signals that occur during lithospheric stress build-up. Thereafter, candidate seismogenic phenomena were reported in increasing numbers worldwide, resulting in expert retreats, special sessions and workshops as reported in the Special issues:

M. Parrot, (M.B. Gokhberg and T. Yoshino, Convenors), M. Johnston, Guest Editors, SEISMO-ELECTROMAGNETIC EFFECTS, Special Issue on the Proceedings of a Workshop on Seismo-Electromagnetic Effects, IUGG XIX-GA 1987, Aug. 9-22, Vancouver, B.C./CANADA; PEPI (Journal on Physics of the Earth and Planetary Interiors), Vol. 57, Nos. 1-2, Elsevier, Amsterdam, Oct. 1989;

and

M. Parrot, (M.B. Gokhberg and T. Yoshino, convenors) and M. Johnston, Guest Editors, Special Issue, Proceedings of a Workshop on Seismo-Electromagnetic Effects, IUGG-XX-GA, Vienna, Austria, 1990, PEPI, Vol. 77, Nos. 1-2, Elsevier, Amsterdam, 1993 April;

which also includes a report by Profs. Anthony C. Fraser-Smith & Robert A. Helliwell of their polarimetrically incomplete (recordings for only one magnetometric axis), but otherwise superb, recordings of seismogenic precursors prior to the Loma Prieta Earthquake (M=7.1) of 1989. It was the purpose of this expert retreat to assemble observational evidence on the precursory magneto-metric (ULF/ELF), electrometric (ULF/ELF/VLF), electromagnetic (VLF-HF), NIR-OPT-NUV and UV/X-Ray emissions as well as of infrasonic (nonlinear magneto/hydro dynamic space-wave generated) phenomena associated with lithospheric stress build-up.

Specific emphasis was placed on developing:

- a consensus on the required new technologies in detecting electromagnetic lithospheric stress phenoma including multi-altitude sensors, multi-station networks, direction finding approaches, multi-spectral sensor signature fusion;
- identification of source mechanisms (lithospheric versus iono/magneto-spheric) and related interactive wave phenomena;
- laboratory experiments of el/magn/elmagn- phenomena related to rock fracture and forced ionized fluid flow through porous rock under severe pressure;
- active seismogenic experiments such as forced explosions in lithospherically stressed regions (recently carried out successfully in the C.I.S. and Japan);
- assembly of recent results on other precursory geophysical phenomena such as: (i) crustal parameters (seismicity, stress, strain, torsion, tilting, etc.), (ii) geochemical parameters (water level and subterranean flow, Radon emission, radio-activity, air glow (NIR-OPT-NUV, UV/X-Ray), (iii) infrasonic space/surface/sub-sea-surface wave phenomena, (iv) lithospheric/atmo-to-mesa-spheric ionization currents, etc. These integrated effects need to be discriminated against those which may be observed during the on-set of, during and after solar-terrestrial storm activity, etc.;
- amplitude and phase signature distortion along the OMEGA global navigational network;
- utilization of interferometric POL-SAR images collected with air and space-borne sensors during lithospheric stress build-up over seismic active regions worldwide and especially within Southern California and Japan for identifying the spatial extent of minute, wide area surface structure variations enforced during lithospheric stress build-up;
- sensory bionic effects such eigenpotential changes of plants and trees, magnetic sensory detection by animals especially snakes, fish and birds as well as mamals residing deep in the stressed hydrospheric lithosphere;
- assembly of complete historical seismoelectromagnetic databases for all global

- seismic regions;
- other phenomena.

As a result of these lively presentations and discussions, it was the general consensus that in a first step, the multi-spectral metrology for each and every spectral domain need to be rapidly advanced including full polarimetric approaches; simultaneously, a rather dense network of complete signature observatories need be established in selected regions (not necessarily the same as those proposed by the curia of 'venerable classical prediction seismologists' for IAGA). In addition, electromagnetically quiet multi-altitude sensor platforms need to be developed from sea/ocean-bottom-surface to within and above iono/magneto-spheric altitude deployment. The proposal for a specific "seismogenic model observatory" are appended, which should also be of direct relevance to ongoing military high resolution surveillance research (ASW, BHS, Airborne and Space Surveillance, etc.).

It was suggested that the current endeavour of establishing a worldwide **INTER-MAGNETIC Network** (under the able guidance of Dr. Arthur (Bill) Green, USGS/Golden) be readily expanded to house at each observatory in parallel each one complete ground based seismogenic observatory.

Similar to the requests made during IGARSS'93 and URSI-GA'93, during IWEPREP'93 the definite request was made that every possible means be explored for reducing unnecessary anthropogenic noise generation covering the entire acoustic, electromagnetic, seismic and seismogenic spectral domains. Also, the question of unnecessary patent applications of metrological procedures hampering the progress in advancing metrology and signature processing was discussed resulting in a common consensus similar to the one reached during IGARSS'93 and URSI-GA'93.

A copy of our recent PEPI contribution:

J.Y. Dea, P.M. Hansen and W-M. Boerner, (INVITED), Long-term ELF Background Noise Measurements, the Existence of Regional Polarimetric Low Noise Windows, and Applications to Earthquake Precursor Emission Studies, Journal 'Physics of the Earth and Planetary Interiors', Special Issue on 'International Decade for Natural Disaster Reduction: Electromagnetic Methods for Natural Disaster Warning (Topic: Crust-generated Electromagnetic Emissions)', PEPI, Vol. 77, Issue 1-2, pp. 109-125, 1993 April;

is appended to serve as a tutorial introduction on how to proceed. However, a perusal of this paper as well as other contributions to the two pertinent Special Issues of 'PEPI' immediately will draw the attention of the reader to the immense financial resources required to elevate the multi/intro-disciplinary science of seismo-electromagnetology to a mature status. In the US, neither NSF, USGS, EPA, NOAA nor Special Programs of DOE can provide the required resources or the scientific shelter. Therefore, at the same time, we urgently require the establishment of a multi/inter-disciplinary National research funding agencies as is proposed in the structure of the 'NATIONAL INSTITUTES FOR THE ENVIRONMENT' (see attachment). Currently, the scope of the proposed 'NIE' is a little too narrow and it needs be expanded to include 'environmental multi/inter-disciplinary sciences' of NSF, NOAA, EPA, USGS, DOE, DOT, etc. and also of DOD. Namely, in full recognition of the ongoing hitherto peaceful transition from 'Nationalist Industrial-Military toward Global Environmental Defense', the 'Strategic Environmental Research Defense Program: SERDP' ought to be made a full directorate under NIE in order to foot the support for the interagency collaboration required to develop 'Seismo-Electromagnetology' and similar large-scale scientific endeavors.

In conclusion, the results of IWEPREP'93 are most encouraging and the forthcoming Proceedings to be published also with PEPI, should serve as an eye opener and promoter of interest in a new timely and urgently to be developed highly multi/inter-disciplinary science namely that of 'seismo-electromagnetology'.

Here, I would like to add my sincere thanks to Profs. Takeo Yoshino, Mikhail Borisovich Gokhberg, and especially to Prof. Masashi Hayakawa for their invitation and hospitality.

CONCLUSIONS

In retrospect, the most important findings during my 1993 August 15 - September 09 Japan travel for attending the Research Conferences IGARSS'93, URSI-GA'93 and IWEPREP'93 amplify the serious current problems already identified in the Introduction, namely:

- (1) The onslaught of an impending electromagnetic, acoustic, seismic and seismogenic noise signature catastrophe due to the uncontrolled and rapid increase and worldwide distribution of anthropogenic noise sources of varied types and origin, i.e., '**uncontrolled radiation littering of the terrestrial biosphere**'. (It seems as if with the advent of '**peaceful East-West collaboration**' the stringent electromagnetic/acoustic noise reduction enforcements may have as well been liberated!).
- (2) The unanswered quest and the hitherto neglected urgency for providing an increased number of '**well-spaced spectral windows**' for scientific purposes and wide area electromagnetic surveillance of the terrestrial covers and biosphere.
- (3) Uncontrolled patent-leasing and commercialization of sensor and image signatures pertinent to global environmental defense.

Certainly, the US DoD will have to step up controlling action on noise reduction and on the unwarranted commercialization of environmental signature data.

In order to overcome the lack of '**free scientific spectral windows**', UWB impulse sensing and imaging must be advanced to become fully polarimetric in order to obtain the required extra-wideband POL-INTERFEROMETRIC-SAR/SAL signatures for a better interpretation of our terrestrial biosphere and also of the planetary hydrospheres.

It will become necessary to ban - once and for all - direct private satellite TV reception by wide-area coverage and also to ban private mobile telephony and instead use optic fibre (cable) tele-communication. Furthermore, as already successfully demonstrated in Japan and FRG, telephone lines, open-air/above-ground electric power transmission must be banned and a well shielded underground electric power distribution network with balanced double-synchronous phase operation be introduced to reduce radiation which negatively effects our biosphere as well as wide area surveillance of terrestrial environment. As was demonstrated in Sweden/FRG/France and Japan, electric mass transportation systems must be operated not with DC but at slightly raised AC ($16 \frac{2}{3}$ - 20 Hz) frequencies so reducing the spurious noise spikes during acceleration/deceleration of electric trains which has become a serious problem in Italia and, for example, also with 'BART' in the San Francisco Bay area.

With the ever increasing population density growth in lithospherically stressed regions which strongly overlap with high density populated regions, we require to advance wide area interferometric stress detection sensors which can be derived from extending interferometric (Fourier transformation) POL-SAR imaging approaches operated on air and space-borne platforms. Similarly, lithospheric stress build up analyses will require the rapid advance of theory, metrology, sensor technology, sensor networking of integrated seismo-electromagnetic earthquake/volcano eruption prediction - a new inter/multi-disciplinary science and technology which now can be developed. Here, a severe warning is at place in that further balking by the seismologic US Curia against seismogenic earthquake prediction research will certainly place us far behind Japan, SE Europe, Russia and even P.R. China!

As regards social travel observations, I feel confident to state with bitter sadness that the number of US High School to Secondary Students, Post-doctoral Fellows, Scientists and Academicians active abroad is at its absolute low; and it is deplorable to observe that at a time when we are retracting our military forces and civilian personnel, we at the same time are reducing the number of our "**highly educated scholars and trained scientists/laymen to go abroad**". The increasing number of culturally and scientifically rather poorly educated businessmen is no replacement but rather an annoyance which - as in the case of 'black-market operations' - need be

carefully monitored! As regards the intellectual build-up of the NW Pacific Rim region including Pacific Siberia (where supposedly the most gifted - by weight of grey braincells - humans reside), we need to increase our presence and definitely not reduce it; i.e., at the same time that we are reducing the relevance of NATO, we need to build up a new alliance rapidly, namely, a North/Austral Pacific Treaty Organization for portecting us against the aggressive militant expansion forces which have unfortunately taken almost complete control of P.R. China and which will confront us daily from now on into the not foreseeable future.

In conclusion, we must work very hard to integrate the former USSR into the Free World System by elevating the NW Pacific Rim Allies in rank and relevance and by bonding the former NATO with the Pacific Rim Allies. This in turn, requires the strengthening of our DOD Liaison Offices in Europe and the Far-East with possibly opening another set of branch offices within C.I.S. (St.-Petersburg and/or Moscow, Novosibirsk and/or Irkutsk, Vladivostok and/or Khabarovsk), once the current turmoil in Russia settles, the 'apparatchuks' have been ousted, and the real reform process can materialize (see 1993 Europe/Siberia Travel Report, for more detail).

Again, I wish to express my sincerest gratitude for the support I received from AFOSR/NI & AOARD; and that I should feel honored to be given the opportunity of assisting their efforts in opening the 'WINDOWS OF SCIENCE' even wider in the spirit of a truly 'Peaceful Transisiton from Nationalist Industrial-Military toward Global Environmental Defense'.

WMB:rwf:WMB-1,1.3